CLAIMS A heterostructure bipolar transistor 2 characterized in that constituent devices of a compound 3 semiconductor forming a base layer contain at least Ga, As, and Sb, and constituent devices of a compound 5 semiconductor forming an emitter layer contain at least In, Al, and P. 2. A heterostructure bipolar transistor 2 according to claim 1, characterized by comprising: 3 a substrate made of InP; a collector layer formed on said substrate and 5 made of a compound semiconductor containing indium and 6 phosphorus; 7 said base layer formed on said collector layer and made of a p-type compound semiconductor containing 8 9 gallium, arsenic, and antimony; and 10 said emitter layer formed on said base layer 11 and made of an n-type compound semiconductor containing 12 indium, aluminum, and phosphorus, 13 wherein a composition ratio of indium to 14 aluminum in said emitter layer is in a range within 15 which a potential energy, in a conduction band edge on a 16 side of said base layer, of said emitter layer is not 17 less than that in a conduction band edge of said base 18 layer. A heterostructure bipolar transistor

according to claim 1, characterized in that at least one

2

- 3  $GaAs_{(x)}Sb_{(1-x)}$  layer is used in said base layer, at least
  - 4 one  $In_{(1-y)}Al_{(y)}P$  layer is used in said emitter layer, and
  - 5 x and y represent mixed crystal compositions and fall

  - within ranges of 0 < x < 1 and 0 < y < 1, respectively. 4. A heterostructure bipolar transistor
  - 2 according to claim 3, characterized in that the range of
  - 3 the composition x is  $0.2 \le x \le 0.8$ , and the range of the
  - composition y is  $0 < y \le 0.5$ . 4

6

- 5. A heterostructure bipolar transistor
- 2 according to claim 4, characterized in that a
- 3 relationship between x and y is  $0.49x + 1.554y \ge 0.25$ .
  - 6. A heterostructure bipolar transistor
- 2 according to claim 5, characterized in that the ranges
- 3 of the compositions x and y are  $0.45 \le x \le 0.55$  and 0 <
- $y \le 0.25$ , respectively, and the relationship between x 4
- and y is  $0.49x + 1.554y \ge 0.36$ . 5
  - 7. A heterostructure bipolar transistor
- according to claim 1, characterized in that the 2
- composition ratio of Al in said emitter layer decreases 3
- away from said base layer.
  - 8. A heterostructure bipolar transistor
- 2 according to claim 1, characterized in that the
- 3 composition ratio of As in said base layer decreases
- away from said emitter layer. 4
  - 9. A heterostructure bipolar transistor
- according to claim 1, characterized in that said 2
- collector layer is made of a compound semiconductor 3

containing indium, aluminum, and phosphorus. 10. A heterostructure bipolar transistor 2 according to claim 9, characterized in that 3 said base layer is made of  $GaAs_{(x)}Sb_{(1-x)}$ , said collector layer is made of  $In_{(1-z)}Al_{(z)}P$ , 4 5 and 6 x and z represent mixed crystal compositions 7 and fall within ranges of 0 < x < 1 and 0 < z < 1, respectively. 8 A heterostructure bipolar transistor 11. 2 according to claim 10, characterized in that 3 the range of the composition y is  $0 < y \le$ 4 0.18, and 5 the relationship between x and y is 0.49x +6  $1.554z \le 0.36$ . A heterostructure bipolar transistor 2 according to claim 9, characterized in that the composition ratio of Al in said collector layer 3 decreases away from said base layer. 4 A heterostructure bipolar transistor according to claim 1, characterized in that 2 3 layers including said base layer and emitter 4 layer forming the heterostructure bipolar transistor are 5 formed by metal organic chemical vapor deposition, and 6 carbon is doped as a dopant to said base 7 layer. 14. A heterostructure bipolar transistor

- 2 according to claim 13, characterized in that said base
- 3 layer is formed at a growth temperature of not less than
- 4 480°C.